

REMARKS/ARGUMENTS

The Office Action mailed December 5, 2003, has been reviewed and the comments therein carefully considered. Reconsideration and allowance of the instant application are respectfully requested in view of the amendments and remarks presented in this response.

Applicants note with appreciation that the Examiner has indicated that claim 6 would be allowable if rewritten in independent form and claim 1 would be allowable if step (a) were amended pursuant to the Examiner's proposed amendment.

Claims 1-8 and new claims 12-15 remain pending. Claim 1 has been amended to more clearly and particularly claim the presently claimed embodiments of the invention. Dependent claim 4 has been amended to correct a typographical error. Dependent claims 12-15 have been added. Support for these amendments can be found throughout the specification, and no new matter has been introduced. Claims 9-11, drawn to a non-elected invention, have been canceled without prejudice or disclaimer. Applicants expressly reserve the right to pursue the canceled subject matter in a divisional application pursuant to 35 U.S.C. § 120.

Rejections Under 35 U.S.C. § 103

Claims 1, 5, 7 and 8 stand rejected under 35 U.S.C. 103(a) for being unpatentable over Allaire et al. U.S. Patent No. 5,024,978 in view of Jang et al. U.S. Patent No. 5,936,861. Claim 2 stands rejected under 35 U.S.C. 103(a) for being unpatentable over the references as applied to claim 1, and further in view of Gardner et al. U.S. Patent No. 5,154,787. Claims 3 and 4 stand rejected under 35 U.S.C. 103(a) for being unpatentable over the references as applied to claim 1, and further in view of Clarke et al. U.S. Patent No. 5,562,966. Claims 1, 3-5, 7 and 8 stand rejected under 35 U.S.C. 103(a) for being unpatentable over Hilmas et al. U.S. Patent No.

6,355,338 in view of Jang et al. Claim 2 stands rejected under 35 U.S.C. 103(a) for being unpatentable over the references as applied to claim 1, and further in view of Gardner et al. U.S. Patent No. 5,154,787.

Amended independent claim 1 is directed to a method of making a composite three-dimensional object from a continuous filament formed of green matrix material surrounding a continuous fiber. Briefly, the filament is guided to a movable assembly from which it is deposited in a layer-wise manner onto a working surface associated with the movable assembly. The filament is deposited without any compression forces being applied to the filament as it is being deposited. The deposited portion of the filament is heated along with the portions of the filament layers adjacent (next to and below) the deposited filament. A compression force is applied to the heated portion to consolidate and bond the green matrix material of the deposited filament and portions of the adjacent filament layers. Dependent claims 2, 3, 5-8 and 12-15 each depend from claim 1. Dependent claim 4 depends from claim 3.

Allaire et al. is cited as disclosing a method of making a ceramic matrix composite. Allaire et al. describe an organic thermoplastic vehicle for use in combination with a powdered matrix in forming coated fibers. The Office Action concedes that Allaire et al. do not disclose making a lay-up of fiber by using a movable assembly to deposit coated fiber on a working surface. Rather, Allaire et al. describe manually cutting and arranging the coated fiber, forming a ceramic composite plate and stacking the composite plates to form a product that can be consolidated into a dense composite article. Thus, Allaire et al. do not disclose, teach or suggest the invention of claims 1-5 or 7-8 or new dependent claims 12-15.

Hilmas et al. is cited as disclosing a method of making a desired architecture from a

continuous filament. The Office Action concedes that Hilmas et al. do not disclose laying up the fiber using a movable assembly. Hilmas et al. instead generally teach that shaped green bodies can be formed from the filaments, and simply disclose that the filaments can be formed into “[a]ny shape that can be compression molded or otherwise formed by plastic deformation.” Thus, Hilmas et al. do not disclose, teach or suggest the invention of claims 1-5 or 7-8 or new dependent claims 12-15.

Jang et al. is cited for describing that three-dimensional composite material objects can be made in a cost-effective fabrication process from continuous fiber reinforced composite material in a layer-by-layer manner using a dispensing head to dispense a mixture of reinforcement fiber impregnated with a matrix material onto a base member. Jang et al. actually describe extruding the filament coated with a thermoplastic or metal material through a nozzle having a discharge orifice of a predetermined size. The nozzle further includes heating elements to melt the coating prior to the filament being extruded out of the nozzle. Jang et al. fail to disclose a movable assembly that can be used to deposit a filament without application of compression forces on the filament, which may have been previously extruded, compressed or formed. Jang et al. also fail to disclose a movable assembly with associated working surface that provides for heating of the deposited filament along with the portions of the filament layers adjacent (next to and below) the deposited filament. Jang et al. further fail to disclose the application of a compression force to the heated portion to consolidate and bond the matrix material of the deposited filament and portions of the adjacent filament layers. Thus, Jang et al. do not disclose, teach or suggest the invention of claims 1-5 or 7-8 or new dependent claims 12-15.

Gardner et al. is cited for teaching heating of the prepreg tow prior to contact with the

substrate and previously-collected tow. Gardner et al. simply teach a preform fabrication procedure in which a prepreg tow is collected on a collection substrate such as a drum, to provide a prepreg mat. Gardner et al. further describe that the prepreg mat can be manually cut into sheets and stacked. Gardner et al. fail to disclose a method for forming three-dimensional objects using a movable assembly to guide and deposit filament onto an associated working surface. Thus, Gardner et al. do not disclose, teach or suggest the invention of claim 2 or new dependent claims 12-15.

Clarke et al. is cited for teaching that carbon fibers can be provided with a uniform, oxidation inhibitor layer of inhibitor such as silicon carbide, boron carbide or boron nitride to protect the carbon fibers. Clarke et al. actually disclose suspending particles of an oxidation inhibitor in a sizing solution in which a carbon fiber to be protected is immersed to provide a thin polymeric film on the surface of the fiber. Clarke et al fail to disclose use of an interface layer between a matrix material and a fiber to enhance non-brittle failure characteristics of the composite, as well as oxidation protection. Thus, Clarke et al. do not disclose, teach or suggest the invention of claims 3 or 4 or new dependent claims 12-15.

None of the cited references, whether taken alone or in combination, disclose, teach or even suggest the present methods for making a composite three-dimensional object as claimed in claim 1. The dependent claims 2-5, 7-8 and 12-15 specify further limitations and are allowable over the cited references for at least the same reasons that claim 1 is allowable. Reconsideration and withdrawal of the rejections are respectfully requested.

Rejections for Obviousness-Type Double Patenting

Claims 1, 3, 5, 7 and 8 stand rejected under the judicially created doctrine of

obviousness-type double patenting for being unpatentable over claims 9 and 10 of Hilmas et al. U.S. Patent No. 6,355,338 in view of Jang et al. and Allaire et al. Claim 2 stands rejected under the judicially created doctrine of obviousness-type double patenting for being unpatentable over the references as applied to claim 1, and further in view of Gardner et al. U.S. Patent No. 5,154,787. Claim 4 stands rejected under the judicially created doctrine of obviousness-type double patenting for being unpatentable over the references as applied to claim 1, and further in view of Clarke et al. U.S. Patent No. 5,562,966.

The Office Action concedes that Hilmas et al. do not claim arranging the filament into a desired architecture by passing the filament to a movable assembly and depositing, heating, compressing and solidifying the filament. For all of the reasons set forth above, it is respectfully submitted that the Office Action has failed to show that claims 1-5 and 7-8 would be obvious over Hilmas et al. in view of any one or more of the secondary references cited. Reconsideration and withdrawal of this ground of rejection are respectfully requested.

CONCLUSION

It is believed that no fee is required for this submission. If any fees are required or if an overpayment is made, the Commissioner is authorized to debit or credit our Deposit Account No. 19-0733, accordingly.

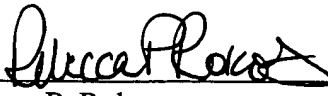
All rejections having been addressed, applicant respectfully submits that the instant application is in condition for allowance, and respectfully solicits prompt notification of the same.

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Amendment dated March 5, 2004
Reply to Office Action of December 5, 2003

The Examiner is invited to contact the undersigned if necessary to facilitate prosecution of this application.

Respectfully submitted
BANNER & WITCOFF, LTD.

Date: March 5, 2004



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